
Potential clinical applications of placental stem cells for use in fetal therapy of birth defects.

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Authors: Melissa Vanover, Aijun Wang, Diana Farmer

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Funding Grants: Placental Stem Cells for the In Utero Treatment of Spina Bifida

Public Summary:

There has been growing interest in stem cells for the treatment of a wide variety of diseases. Stem cells isolated from human placenta, a biologic material that is often discarded after pregnancy, are particularly promising due to their ease of collection and ability to differentiate into different types of tissue. The potential therapeutic role of stem cells derived from the placenta have been studied for wound healing, heart disease, autoimmune disorders, and chronic lung or liver injury. Surgical intervention on a fetus still in the womb for structural birth defects, such as spina bifida, has rapidly progressed as a field due to advances in maternal-fetal medicine and improving surgical techniques. In utero treatment of structural and other non-structural congenital disorders with cell-based therapies is of particular interest given the immature fetal immune system, which reduces the potential for rejection of transplanted cells. A comprehensive literature review was performed to assess the current state of placenta-derived stem cells for in utero treatment of congenital disorders. Most studies are still in the preclinical phase, utilizing animal models to test the effect of these stem cells on specific congenital disorders. Future research endeavors may include re-transplantation of genetically modified cells collected during pregnancy or even cell-free therapies, which further reduce the risk of rejection. Though much work still needs to be done, placental stem cells are a promising therapeutic agent for fetal intervention for congenital disease.

Scientific Abstract:

Placental stem cells are of growing interest for a variety of clinical applications due to their multipotency and ready availability from otherwise frequently discarded biomaterial. Stem cells derived from the placenta have been investigated in a number of disease processes, including wound healing, ischemic heart disease, autoimmune disorders, and chronic lung or liver injury. Fetal intervention for structural congenital defects, such as spina bifida, has rapidly progressed as a field due to advances in maternal-fetal medicine and improving surgical techniques. In utero treatment of structural, as well as non-structural, congenital disorders with cell-based therapies is of particular interest given the immunologic immaturity and immunotolerant environment of the developing fetus. A comprehensive literature review was performed to assess the potential utilization of placenta-derived stem cells for in utero treatment of congenital disorders. Most studies are still in the preclinical phase, utilizing animal models of common congenital disorders. Future research endeavors may include autologous transplantation, gene transfers, induced pluripotent stem cells, or cell-free therapies derived from the stem cell secretome. Though much work still needs to be done, placental stem cells are a promising therapeutic agent for fetal intervention for congenital disease.

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